Space Weather Forecast

Issued on Saturday, 23 March 2024 at 00:41 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts (R1/R2) likely. Chance of minor geomagnetic storm G1 peaking Monday 24 March.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to become moderate in the UTC day of Friday 22 March, with frequent mid-ranking Common-class flares giving way to a mid-ranking Moderate-class flare peaking at 22/2032UTC. This flare emanated from the largest and most complex sunspot region on the facing side, currently near the middle of the Sun. This sunspot region ended the 24 hours showing amongst the most complex magnetic classifications, having undergone rapid development of its trailing spots especially in the period, with extensive growth in its overall size also seen. This was one of six sunspot regions seeing out the UTC day, a relative decline from the ten that started the period, with western solar horizon exits and fading in situ accounting for the losses. Changes in the remaining spots were relatively small by way of comparison.

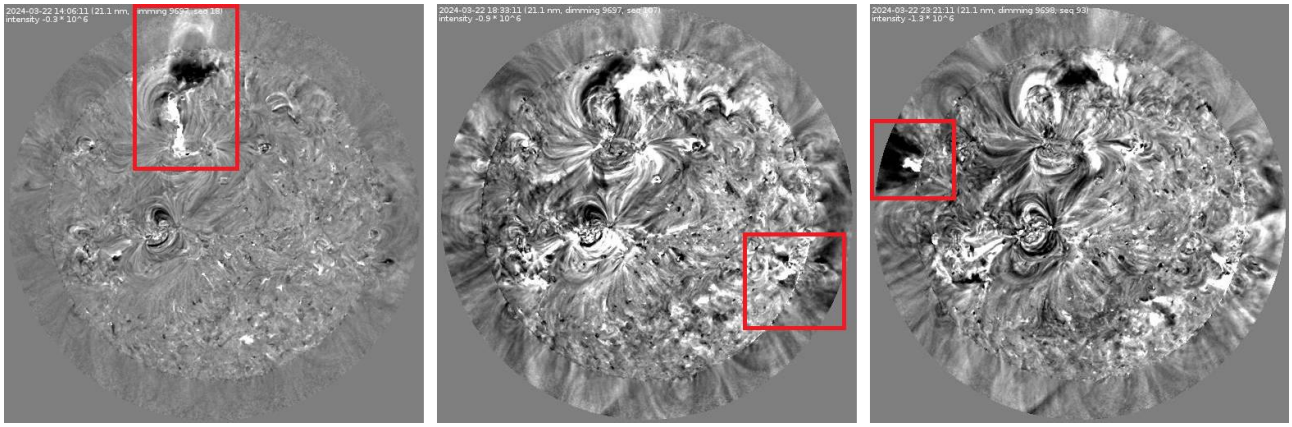

Figure 1: SIDC ROB time integrated ‘coronal dimmings’, showing unanalysed CME candidates observed in the 24-hour period boxed in red. All are expected to be marginal glances of Earth at worst given their relatively peripheral emission locations, although the rightmost may hint at increased activity to come, perhaps being tied to an arriving sunspot region.

The main activity observed in the period included a faint Coronal Mass Ejection (CME) seen heading northwest after 22/0700UTC, with the source uncertain but perhaps associated with a 'filament' (arc of plasma) in the northeast. This CME is expected to miss Earth.

Later in the UTC day, a fast, high solar latitude CME was first visible around 22/1500UTC. This appeared to initially trigger from immediately east of one of the sunspots in the northeast, tracking northwards on the face of the Sun for a time before leaving largely aimed northward at a higher solar latitude. Modelling for this event is pending as of the time of issue of this guidance document. There were then events from the southwest (a possible 'filament eruption' seen at 22/1700UTC),

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and also a CME from a possible arriving sunspot region on the northeastern solar horizon (at 22/2230UTC). Both of these events are awaiting imagery for modelling.

Finally, at the time of writing, there was no obvious CME visible in extreme UV emanating from the large Moderate-class X-ray event - this remains a source of monitoring given its position near the middle of the Sun. No Earth-bound CMEs were therefore identified in the period.

Solar Wind / Geomagnetic Activity: The solar wind started under the influence of the tail of a CME that left the Sun on 17 March and reached Earth around 21/1500UTC. This perhaps gave way to a slow solar wind regime around 22/0500UTC, with a minor step change visible in many solar wind measures at this time.

The solar wind speed was within background levels throughout, falling slightly over the 24 hours. The number of particles in the solar wind fell over the same interval: from early slightly elevated highs to decline into background. The associated magnetic field peaked at slightly elevated levels, with a relatively stable magnitude, with the north-south component showing an overall co-aligned bias (with Earth's field - helping to limit geomagnetic effects). The net result of the above solar wind measures was mainly quiet.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely, with isolated Moderate-class flares probable from the large and complex sunspot region near the middle of the Sun, with a slight chance of Strong-class. The most significant front side region remains present throughout the four days, and there are now signs that there may be an oncoming active region in the northeast. The flare risk is now held constant throughout the four days.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. The next notable enhancement will be from the arrival of a coronal hole fast wind, most likely on Day Two (Monday 24 March) with slightly elevated to elevated solar winds forecast. Mainly quiet geomagnetic activity is expected to bookend this arrival, separated by a peak chance of isolated G1 Minor Geomagnetic Storm intervals on Monday 24 March.

Energetic Particles / Solar Radiation: There is a rising slight chance of Minor Solar Radiation Storms (S1) from any notable flaring from the largest sunspot group.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	50	20	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	No	15	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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